

---

REVIEW OF U.S. EPA DEMAND FOR REMOVAL ACTION

Saad Site  
Nashville, Tennessee

Prepared For:

*Saad Site Steering Committee  
Nashville, TN*

Prepared By:

*Christopher M. Teaf, Ph.D.  
President & Director of Toxicology  
Hazardous Substance & Waste Management Research, Inc.  
Tallahassee, FL*

February 23, 1994

---

## *Introduction*

By a letter dated December 28, 1993, Mr. Fred Stroud of U.S. EPA, Region IV has required of the Saad Site Steering Committee (SSSC) that "removal" be performed for all soils on the Saad Site that exceed a concentration of 250 mg/kg Total Recoverable Petroleum Hydrocarbons (TRPH). The 250 mg/kg TRPH value is cited in the December 28 letter as a proposed industrial cleanup guideline developed by the Tennessee Department of Environment and Conservation (TDEC) specifically to be applied in the State of Tennessee for protection of human health and the environment. The SSSC has requested that I independently review the U.S. EPA demand for additional removal action. This report contains my opinions as a result of that review.

In the preparation of this report, I reviewed numerous documents, including the following technical reports:

- Removal Action/Field Investigation Report for the Saad Trousdale Drive Site - Nashville, Tennessee, March, 1992 (DRE, 1992);
- Saad Site RA/FI Phase II Report, April, 1993 (DRE, 1993); and,
- December 28, 1993 letter from Fred Stroud of U.S. EPA, Region IV to Bennie Underwood of de maximis, Inc.

In order to assist my understanding of the relative contribution that may be posed by the Saad Site to the areawide conditions, I have visited the site. This visit included the Saad Site proper, the CSX Radnor Yards facility, the berm and associated track areas, the Franklin Brick Company, a tour of Trousdale Road and neighboring industrial/commercial zones within approximately 1 mile of the Site, and the Croft Spring area (now known as the Grassmere Wildlife Park).

The Saad Site ("Site") is approximately 0.4 acre in size and is located in a heavily industrialized area of Nashville, Tennessee. The Site itself is completely fenced on all sides. On the west, it is bordered by the Radnor Yards, a very large rail maintenance yard covering several hundred acres in South Nashville, Davidson County, Tennessee. Several hundred additional acres of industrial property of various types surrounds the Saad Site. On the east it is bordered by Trousdale Road. There are no current occupants using the Site.

### *Prior Removal Actions*

It is my understanding that prior removal action work at the Site has resulted in the following activities in response to EPA Administrative Orders by Consent (AOCs) which were implemented in 1990 and 1992:

- Initial removal action and field investigation activities (RA/FI; DRE, 1992) were conducted at the Saad Site during the period from August to October, 1991 with the objective of reducing or eliminating the risks that may be associated with the direct contact pathway to any hazardous substances on the Site. Removal actions have resulted in the successful removal of all surface and subsurface tanks, sumps and related equipment from the Site;
- A second RA/FI (DRE, 1993) was conducted in 1993 with several objectives including: subsurface drum search and removal, confirmation of the presence of lead and PCB concentrations that were detected in the initial RA/FI, removal of soils which exhibited lead and PCBs at concentrations above Target Response Levels (500 mg/kg and 10 mg/kg, respectively), and performance of additional vadose zone soil sampling and analyses;
- The 1991 and 1992 RA/FI activities resulted in the combined removal of 144,700 pounds of hazardous waste; 92,800 gallons of non-hazardous liquids (contaminated perched groundwater); 72 drums of hazardous waste; 139 drums of non-hazardous waste; 168 cubic yards of non-hazardous surface debris; and 220 cubic yards of soil and subsurface debris (DRE, 1992; DRE, 1993);
- The 1993 RA/FI Phase II Report (DRE, 1993) concludes, in part, that there is no apparent leaching of contaminants from vadose zone materials (based on TCLP non-hazardous determination for disposal of soils and debris). There are minimal vadose zone soils present on-site (80-90% of vadose material reportedly is composed of rocks, boulders and debris). Much of the Site is underlain by a native, stiff, low permeability clay that acts as an aquitard between the perched water table and the limestone bedrock water-bearing zone.

### *Effect of Prior Work*

The extensive RA/FI activities which have been conducted at the Site have allayed effectively any actual or perceived immediate health hazards from aboveground tanks, drums and other containers, as well as from subsurface and surface soils containing PCBs or lead, based on available data. These activities permit the development of an integrated site response to address environmental media in an appropriate fashion, without the requirement for precipitous "removal" action.

### *Propriety and Applicability of the U.S. EPA Proposed Cleanup Target*

U.S. EPA is seeking the removal of soils at the Site that contain TRPH at a concentration greater than 250 mg/kg, a figure which ostensibly is based on a proposed TDEC industrial cleanup guideline. The TDEC recently finalized its state Superfund regulations, however, and determined that it was not appropriate to set generic soil cleanup target concentrations (see Tennessee Superfund regulations; Rule 1200-1-13-.08). Rather, the TDEC required that soil targets should be calculated for individual analytes using the peer-reviewed and generally accepted procedures that are contained in several U.S. EPA risk assessment guidance documents (e.g., Risk Assessment Guidance for Superfund, Volume I, Parts A and B, as well as subsequent supplementary guidance). In addition, the TDEC recognized that background concentrations and site-specific conditions must be considered in establishing appropriate soil cleanup levels at a site. Thus, the State of Tennessee approach is consistent with the U.S. EPA risk-based approach for a situation such as is presented at the Saad Site, and requires an appropriate evaluation of background conditions. The Rule is specific in stating that background should represent either natural, unaffected conditions or, alternatively, may characterize industrial conditions where these are historically appropriate.

In the absence of either a risk-based analysis or a consideration of background conditions in the area of the Saad Site, a determination to arbitrarily excavate soils down to a concentration of 250 mg/kg TRPH is not technically defensible. It is important to note that considerations regarding the potential for

human health effects have been based on a comparison with the post-removal action site data for subsurface soils (e.g., >2 feet bls). Surface soil samples (e.g.,  $\leq 2$  feet bls) that were collected at the Saad Site in October, 1990 prior to the two removal actions at the Site (Underwood, 1994) indicated the presence of analytes at concentrations that typically were much lower than those that have since been detected in the subsurface soil samples (e.g., maximum BETX concentration of 18.4 mg/kg for xylene, range of TRPH concentrations of 44 mg/kg to 18,358 mg/kg, maximum Total Organic Halogens concentration of 113 mg/kg). Given the size of the site and its potential contribution to local conditions, particularly with regard to similar analytes, a risk-based approach as defined by TDEC is appropriate for the Site.

#### *A Review of TRPH Cleanup Levels*

TRPH are present in soil at the Site in detected concentrations of up to 11,000 mg/kg, identified as "low boil" TRPH and 170,000 mg/kg identified as "hi boil" TRPH. The analytical methodology typically compares the "low boil" component with a gasoline standard, and the "hi boil" component of the TRPH with diesel and/or kerosene standards. The predominant material of interest at the site was waste oil. While the determination of TRPH concentrations in soil may be useful as an initial screening indicator for petroleum-contaminated sites, TRPH concentrations alone do not provide sufficient information on which to base conclusions regarding the potential for toxicological effects. Such conclusions must be drawn on the basis of information concerning discrete chemical components of the TRPH, to the extent that these can be identified.

Concurrent with the analyses that were conducted at the Saad Site to determine the concentrations of TRPH in site soils, analyses were conducted for volatile organic compounds (VOCs), base neutral and acid extractable organics (BNAs), pesticides, polychlorinated biphenyls (PCBs), and total metals. The results of analyses for VOCs and BNAs yielded useful information regarding the individual analytes comprising the TRPH. Analysis for VOCs indicated primarily the presence of BETX compounds (benzene, ethylbenzene, toluene and xylene) at concentrations up to 5,200 mg/kg in the case of toluene, a noncarcinogenic compound. The greatest concentration for potentially

carcinogenic VOCs was 3,300 mg/kg for trichloroethylene. The analysis for BNAs indicated the presence of polycyclic aromatic hydrocarbons (PAHs), as well as bis(2-ethylhexyl)phthalate and a few other compounds, such as 4-methylphenol. Some of these compounds, particularly PAHs, are common constituents of TRPH. The maximum detected concentration of BNAs was 130 mg/kg for naphthalene, a noncarcinogenic PAH. The highest detected concentration for carcinogenic PAHs was 3.9 mg/kg for benzo(k)fluoranthene. These are low concentrations, and support strongly that the conclusion that, in this instance, the TRPH are comprised of other, less toxic components.

A comparison of the total VOC and BNA concentrations with the reported TRPH concentrations indicates that approximately 90% of the TRPH concentration remains unidentified for most soil samples. Based on the available data concerning the VOCs and lower molecular weight PAHs, it is likely that the unidentified portion of the TRPH primarily is represented by very high molecular weight PAHs (e.g., >6 rings), and by long chain aliphatic hydrocarbons. Both of these classes of compounds typically exhibit low toxicity and low mobility, directly as a result of the high molecular weight and large size of the molecules. That is, their structures limit absorption and transport in the body, and also minimize environmental mobility. One of the conclusions that was drawn in the Phase II RA/FI report (DRE, 1993), that there is no apparent leaching of contaminants from vadose zone materials at the Site, is consistent with the presence of such high molecular weight, low mobility compounds. It is not reasonable from a human health or environmental standpoint to base a remedial decision on a generic TRPH value, rather than to use the discrete analytes for which data are available. Such generic TRPH values might only be useful for site decisions if there were not available data on principal component analytes. The TDEC Rule, and the preponderance of U.S. EPA guidance, appropriately advocates the application of risk-based evaluation in such instances.

In this context, the greatest detected concentrations of discrete analytes are represented by the BETX compounds, primarily toluene. Elevated concentrations of other VOCs occur in relatively few of the samples [trichloroethylene (TCE) was the next most frequently detected VOC, being present in 21 of 55 soil samples with a mean concentration of 92 mg/kg; only 5 of the 55 samples exceeded 100 mg/kg TCE]. These concentrations do not indicate

an immediate need for expedited "removal" action based on human health or environmental considerations. For example, the maximum detected concentration of TCE in site soils (3,300 mg/kg in one sample; mean concentration of 92 mg/kg) is approximately an order of magnitude greater than the default risk-based soil screening level (260 mg/kg) that was calculated by U.S. EPA Region III (U.S. EPA, 1993) on the basis of potential carcinogenic effects from human industrial exposure to TCE in soil. The 260 mg/kg soil screening level was based on a potential carcinogenic risk level of  $10^{-6}$  (1.0E-06). It should specifically be noted here that the U.S. EPA implements a carcinogenic risk range at Superfund sites from 1.0E-04 to 1.0E-06, depending on site-specific circumstances. Thus, if the soil screening level was based on even a 1.0E-05 potential carcinogenic risk level, the calculated screening level (2,600 mg/kg) would approximate the maximum detected concentration of TCE in soil at the Saad Site, but would far exceed the typical (e.g., mean) concentration. Moreover, if noncarcinogenic soil screening levels for industrial sites were to be applied, as may be appropriate for decisions concerning short-term, "immediate" site risks (e.g., those which might drive initially a "removal" action), the detected concentrations of TCE are approximately one-half of the noncarcinogenic screening level of 6,100 mg/kg that is calculated using the U.S. EPA Region III methodology. Finally, the 92 mg/kg mean concentration of TCE in soils at the Saad Site is much less than the industrial scenario carcinogenic or noncarcinogenic screening values. Similar considerations apply to the other detected analyte concentrations in Saad site soils as well (e.g., EPA Region III soil screening level of 200,000 mg/kg for toluene).

As an additional example of context in which to evaluate the Saad Site hydrocarbon data, urban soils typically exhibit total PAH concentrations in the 10-100 mg/kg range, and values in excess of 100 mg/kg are not uncommon (ATSDR, 1989). Roadside dust containing total PAHs at up to 750 mg/kg has been reported (Bjorseth, 1983). These values typically are higher than PAH values that have been observed in subsurface soils at the Saad Site. Thus, while remedial action ultimately may be appropriate at the Saad Site, the observed concentrations of individual analytes do not pose an immediate risk to human health and the environment that could justify the removal of all site soils above a perched water table, especially since the Site currently is not in use and is secured with permanent site fencing and placarding. These measures, coupled

with the surface conditions at the Site, effectively eliminate the need for the type of time-critical decisions regarding exposure that are central to "removal" actions, in contrast to "remedial" actions.

### *Site Setting*

The Saad Site is in an industrial area, surrounded by several hundred acres of other sites exhibiting contamination by similar or identical analytes. The CSX Radnor Yards, which are located to the west of the Saad property, also exhibit TRPH concentrations in excess of 250 mg/kg over a wide area, according to reports submitted by CSX to the TDEC as a result of site investigations conducted on that property. Thus, creation of an "oasis" of cleanliness at the Saad Site, even if it were feasible by virtue of further "removal" actions, makes little technical sense. There are two buildings adjacent to the Saad Site that appear to rest on soils which contain TRPH over 250 mg/kg. At least one of those buildings (Franklin Brick, which borders the Saad Site to the south) houses an ongoing business operation. Certainly "removal" actions for TRPH just at the Saad Site would not remove whatever generic local threat might be hypothesized from TRPH, since TRPH concentrations in excess of 250 mg/kg would still remain in place over a much wider area than the Saad Site, if a "removal" action was undertaken. In other words, the "removal" action conceivably could extend for a very large area, perhaps miles, if all soils in excess of 250 mg/kg were to be removed from the various facilities.

### *Groundwater*

Regarding groundwater, there are no identified receptors in the vicinity of the Saad Site, since the area is on a municipal water supply. Groundwater is not utilized as a source of drinking water in the area. In view of the presence of the general subsurface conditions in this industrial area, a "removal" action which is directed at groundwater issues solely concerning the Saad Site, while ignoring other nearby facilities, is not technically defensible.



In the past, groundwater contamination issues regarding a feature known as Croft Spring have been raised in the context of facilities in the Trousdale Road area and beyond. Contamination was detected in Croft Spring in the 1960's, while the activities at the Saad Site did not even begin until 1971. During my visit to the Grassmere Wildlife Park (formerly Croft Spring area), I observed the spring at which diesel odors and sheens have been reported in the past (Croft Spring #1). We also were told of another spring on the property (Croft Spring #2), several hundred meters approximately to the east of Croft Spring #1, which has not exhibited such conditions. Croft Spring #1 is very close to and immediately downhill from the "Old House", the manor house of the property. We were made aware that a diesel fuel oil tank and transfer line have been in place at the Old House for many years. Though the age, capacity and condition of the tank and lines are unknown, the fill pipe for the system was identified adjacent to the access road approximately 100 meters to the southeast of the Old House. One estimate of the tank's age exceeded 30 years. The temporal and physical characteristics of the contamination that reportedly occurs in Croft Spring #1 are consistent with a nearby source (e.g., the Old House area), but are not consistent with a source or sources which are over one-half mile distant. For example, it was reported to me that the severity of the diesel fuel release from the spring rapidly increases during or shortly after a rainfall event. This pattern is far more likely to reflect a nearby source. Given that Croft Spring #1 is approximately less than 100 meters directly downgradient from the Old House, and given that Croft Spring #2 does not exhibit diesel contamination, it is clear that the potential source of impact on the stream originating at Croft Spring #1 requires attention (i.e., the tank and lines near the Old House).

### *Past Experience*

I have been involved in numerous risk-based evaluations concerning removal and remedial actions at sites within Region IV. As a result, I have had an opportunity to review the National Contingency Plan (NCP; U.S. EPA, 1990) and a number of OSWER directives as they apply to removal actions, remedial processes and risk-related issues.

The NCP states that under Fund-financed actions only, EPA has the discretion under CERCLA to take removal action, in emergency situations or where the action is otherwise appropriate and consistent with the remedial action that may be taken at the Site. This "removal" action may include physical removal based on applicable or relevant and appropriate requirements (ARARs). However, the NCP also states that strict adherence to ARARs for a given medium would be outside the scope of the removal action when such an extent of cleanup is not necessary for the stabilization of site risks and avoidance of "imminent" threats. Additionally, OSWER Directive 9360.0-02B stresses the key words of immediate risk, prevention of emergency, and timely response as necessary determinants which must be satisfied in order to exempt a site from the statutory limit of \$2 million for a "removal" action (OSWER, 1988).

Significant "removal" action already has been conducted over a period of years at the Saad Site which, judging from the detected concentrations of discrete analytes that remain in site soils, has significantly reduced the risk that may be associated with direct exposure to hazardous substances on-site. Moreover, the 250 mg/kg TRPH concentration does not represent an ARAR, since there is no federal regulatory basis for that value and that numerical value was not adopted by the TDEC. It is not, in any event, a health based concentration. Nor is the excavation of all site soils above a perched water table, as well as excavation of a CSX railroad berm, practical or applicable under a "removal" action, since it is not necessary for the immediate stabilization of risks at the Saad Site.

### *Summary*

The detected concentrations and the distribution of contaminants which have been observed at the Saad Site do not warrant the "removal" action for soils as sought by U.S. EPA. Rather, site conditions merit judgment and evaluation according to the appropriate risk-based principles and requirements of both U.S. EPA and the TDEC. An evaluation of the detected concentrations of discrete analytes in soil at the Saad Site, even considered in light of the maximum detected concentrations, does not indicate an immediate risk to public health, welfare or the environment. Neither health nor environmental issues related to the Site are sufficient to justify such a continuing precipitous excavation and

"removal" mandate, particularly in the context of a non-technically-based target such as the cited 250 mg/kg total TRPH value. Considering the absence of a site-specific evaluation of relevant cleanup standards, the extensive work which has been conducted heretofore at the Site, the presence of buildings over impacted soils, the presence of boulders and other fill material that underlie the Site, the presence of a clay aquitard beneath the Site, the absence of regional groundwater receptors, the surrounding character of the industrial area (including a vast rail yard that has operated for several decades), and the other factors identified above, the "removal" action demand is not supportable. The Site warrants further investigation, perhaps in conjunction with surrounding areas. Such an approach is planned for the CSX Radnor Yards, up to and including the berm area, and the information gathered in that investigation will be useful in determining an appropriate course for the Saad Site. However, until then, the selection of a prescribed action requiring the digging and hauling of soils, boulders, and other fill material to an offsite source for this site at this time is arbitrary and not technically sound.

As a final point, I note that the Saad Site Steering Committee has suggested the installation of an interim measure to collect free product that might be resting on the perched water table. My opinion does not rest on the conduct of that work. Judgments concerning what facilities do or do not represent sources of petroleum contamination in the local or regional groundwater must be accompanied by a thorough catalog of underground storage tanks (e.g., 2 pumps across the road from Franklin Brick Company) which may be of contributory interest in determining a rational strategy for addressing groundwater problems.

## References

- ATSDR (Agency for Toxic Substances and Disease Registry). 1989. Toxicological Profile for Polycyclic Aromatic Hydrocarbons-DRAFT. U.S. Public Health Service. Atlanta, Georgia.
- Bjorseth, A. 1983. Handbook of Polycyclic Aromatic Hydrocarbons. Marcel Dekker, New York.
- DRE (DRE Technologies, Inc.). 1992. Removal Action/Field Investigation Report for the Saad Trousedale Drive Site.
- DRE (DRE Remedial Services, Inc.). 1993. Saad Site RA/FI Phase II Report for the Trousedale Drive Site.
- OSWER (Office of Solid Waste and Emergency Response) Directive 9360.0-02B. 1988. U.S. Environmental Protection Agency. Washington, D.C.
- Underwood, B. 1994. Personal communication. February, 1994.
- U.S. EPA. NCP (National Contingency Plan). 1990. 40 CFR Part 300. National Oil and Hazardous Substances Pollution Contingency Plan. Final Rule. U.S. Environmental Protection Agency.
- U.S. EPA. 1993. Risk-Based Concentration Table, Fourth Quarter, 1993. U.S. EPA, Region III. Philadelphia, Pennsylvania.

(1) *Purpose*

The purpose of this Rule is to provide remediation goals for hazardous substance remediation under chapter 1200-1-13.

(2) *The objective of this Rule is:*

To develop consistent procedures for the development and usage of remediation goals.

(3) *General*

(a) These rules provide two basic approaches for establishment of preliminary remediation goals associated with the remedial investigation in Rule 1200-1-13-.09(2)(a)2. These approaches include the determination of Applicable or Relevant and Appropriate Requirements (ARARs) and Background Concentrations. Preliminary remediation goals may be used to determine whether the Department currently considers a specific concentration of a contaminant as an unreasonable risk to public health, safety, or the environment (e.g., water quality criteria based on protection of aquatic organisms in surface water) or to help evaluate whether an exposure pathway for a specific contaminant is of concern (e.g., whether a specific concentration of a contaminant in soil has potential to leach to ground water). Preliminary remediation goals developed through the review of ARARs and background concentrations may be used to determine if the concentrations of hazardous substances are a regulatory concern, or as remediation goals for interim actions. If a Feasibility Study is required for the evaluation of alternative clean-up actions under Rule 1200-1-13-.09(3), then a risk assessment as specified in Rule 1200-1-13-.08(3)(a)3 is to be included in the feasibility study. The detail of the risk assessment shall be commensurate to the potential exposure and risk to human health and the environment. These rules allow for final remediation goals to be established, subject to Department approval, using either ARARs, background concentrations, site-specific risk assessment or a combination of ARARs, background concentrations, and site specific risk assessment.

1. Responsible parties shall perform a survey to identify all Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are categorized as follows:

(i) Chemical specific requirements - These requirements define acceptable levels of hazardous substances for remediation planning purposes. Advisories, criteria, guidance, rules, or laws specified by the Department and the following shall be evaluated for applicability as chemical specific requirements. Where several chemical specific ARARs exist for the same compound by media, the ARAR with the smallest concentration shall apply.

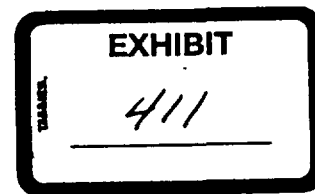
(i) For ground water contamination evaluate the following:

1. Ground water used or classified as drinking water, domestic or residential water supply:

A. Specific criteria for domestic water supply as promulgated by the Water Quality Control Board,

B. Maximum Contaminant Levels (MCL's) and action levels established under the Federal Safe Drinking Water Act in 40 CFR §141 as amended. (See Table 8-1),

C. When MCL's are not available, Secondary Maximum Contaminant Levels (SMCL's) established under the Federal Safe Drinking Water Act in 40 CFR §141 as amended. (See Table 8-1),



concentrations and/or criteria for action levels under proposed 40 CFR 264.94, Subpart S (Federal Register July 27, 1990) may be used.

- E. Concentration limits listed in Table 1 of 40 CFR 264.94 incorporated by reference at Department Rule 1200-1-11-.06(6)(a) effective February 13, 1994; or
    - F. Concentration Limits identified for the facility in a facility permit issued under 40 CFR 264.92 through 40 CFR 264.95 as incorporated by reference in Department Rule 1200-1-11-.06(6)(a) effective February 13, 1994.
  - II. Ground water not used or classified as drinking water, domestic, or residential water supply:
    - A. Water quality criteria for ground water as promulgated by the Water Quality Control Board; or
    - B. Concentration Limits identified for the facility in a facility permit issued under 40 CFR 264.92 through 40 CFR 264.95 incorporated by reference in Department Rule 1200-1-11-.06(6)(a) effective February 13, 1994.
  - III. Ground water which recharges surface water:
    - A. Water quality criteria for ground water as promulgated by the Water Quality Control Board; or
    - B. Concentration limits identified for the facility in a facility permit issued under 40 CFR 264.92 through 40 CFR 264.95 incorporated by reference in Department Rule 1200-1-11-.06(6)(a) effective February 13, 1994.
- (II) For soil exemption criteria and preliminary remediation goals evaluate the following:
  - 1. Reserved.
- (III) Sediment
  - 1. Reserved.
- (IV) Air For air evaluate the following:
  - I. Fugitive dust control as required under the Tennessee Air Pollution Control Act (TAPCA) and regulations.
  - II. Visible standards as required under the TAPCA and regulations.
  - III. Volatile organic compound emission standards required under the TAPCA and regulations.
- (V) Surface Water For surface water evaluate the following:
  - 1. Water quality criteria and highest beneficial use of receiving stream determined by the Water Quality Control Board. The contaminant or sediment load which a stream can carry as determined by the Division of Water Pollution Control. Likewise, for a specific site, the Division

effluent concentration standards or limits. Standards or limits established by the Division of Water Pollution Control shall be considered as ARARs.

- II. Water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published pursuant to section 304(a) of the Federal Water Pollution Control Act.
- III. If the surface water is classified for drinking water, the following shall also be evaluated as ARARs:
  - A. Maximum Contaminant Levels (MCL's) and action levels established under the Federal Safe Drinking Water Act in 40 CFR §141, as amended. (See Table 8-1).
  - B. When MCL's are not available, Secondary Maximum Contaminant Levels (SMCL's) established under the Federal Safe Drinking Water Act in 40 CFR §141 as amended. (See Table 8-1).
  - C. When MCL's and SMCL's are not available, guidance such as concentrations meeting criteria for action levels under proposed 40 CFR §264 Subpart S (Federal Register July 27, 1990) may be used.

- (ii) Location specific requirements - Location specific requirements set restrictions on activities within specific locations such as flood plains or wetlands.
- (iii) Action specific requirements - Action specific requirements set restrictions for particular treatment and disposal activities.

2. Responsible parties shall establish background concentrations of the contaminants at the site. Background contaminant levels for the media of concern must be determined in a similar area, in close proximity, and, to the extent possible, in an area unaffected by a site or contamination. This background may be a natural background in relatively unindustrialized or non-commercial areas or control background in industrialized or commercial areas where natural background concentrations are not attainable due to long term industrial or commercial activities. Where background concentrations protect public health, safety, and the environment, remediation goals will not be established by the Department less than the corresponding natural background or control background levels. If the Department has reason to suspect background concentrations do not protect public health, safety, and the environment, the Department may require the liable party to assess the risk posed by background concentrations of the hazardous substance.

- (i) Natural background levels shall be determined by one of the following methods or other methods approved by the Department:
  - (I) Utilization of publicly available historical data where the contaminant of concern is at naturally occurring levels and quality assurance/quality control documentation is available which demonstrates sample reliability;
  - (II) Establishment of the geometric mean of site background through sampling and analytical analysis; or
  - (III) The medium-specific practical quantitation limit, if a background concentration is not quantifiable.
- (ii) Control background shall be determined by one of the following methods or other methods approved by the Department:

- (II) The medium-specific practical quantization limit, if a background concentration is not quantifiable.

- 3. Responsible parties shall propose for Departmental evaluation remediation goals based on human health and environmental risk assessment included in the feasibility study required in 12001-1-13-.09(3).

The Human Health and Environmental Risk Assessment Method is a qualitative and quantitative process to characterize the nature and magnitude of risks to public health, safety, and the environment from exposure to hazardous substances, pollutants, or contaminants released from specific sites. This process may also characterize risks to the environment when the weight of evidence indicates that effects other than toxicity are significant.

(i) Human Health Risk Assessment Method

- (I) The Human Health Risk Assessment shall include detailed site specific analyses and logical summary of the following unless otherwise approved by the Department:
  - I. Site History
  - II. Data collection
  - III. Data evaluation and identification of chemicals of potential concern
  - IV. Exposure assessment
  - V. Toxicity assessment
  - VI. Risk characterization and uncertainty analyses
  - VII. Calculation of remediation goals for each chemical of concern based on the risk assessment and include in the summary all assumptions used in the calculations.
- (II) Guidance documents in conducting Human Health Risk Assessments include, but may not be limited to the following:
  - I. Risk Assessment Guidance for Superfund: Volume 1 Human Health Evaluation Manual (Part A) Interim Final, December 1989; and
  - II. Risk Assessment Guidance for Superfund: Volume 1 Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) OSWER Directive 9285.7-01B, Interim, December 1991.
- (III) Quantitative techniques of distributional analysis such as Monte Carlo simulations may be utilized in the risk assessment method provided that the reliability of the model and predictions are documented to the satisfaction of the Department. All risk assessments utilizing quantitative techniques shall include uncertainty analyses including, but not limited to the following:
  - I. Parameter uncertainty analysis - Define and provide the rationale for the distribution of all input parameters and the degree of dependence (i.e., covariance) among parameters.
  - II. Identify and describe all assumptions and incomplete information which have not been taken into account in the quantitative uncertainty analysis.

(ii) Environmental Risk Assessment Method

- (I) Fish and aquatic life



- I. Identify rare species, proposed and listed endangered or threatened species, and critical habitats which have been identified within a 4 mile radius of the site. This requirement is met by including rare species, proposed or listed endangered or threatened species, and critical habitats identified by the Tennessee Wildlife Resource Agency (TWRA), the Department's Division of Ecological Services, and the U.S. Department of Interior Fish and Wildlife Service. Determine if the area possibly impacted by the site contains critical habitats or habitats common to any rare species, or proposed or listed endangered or threatened species.
- II. Where there is a release to surface water, evaluate the impact of the site on fish and aquatic life using methods or procedures such as benthic organism studies, toxicity testing, assessing tissue concentrations of chemicals with log of the octanol/water partition coefficient values greater than 3.5 or other methods or procedures approved by the Department to evaluate the impact on fish and aquatic life. Organize the information into a logical form and present both a detailed analysis and a summary of the results, assumptions, uncertainty, incomplete information, and impact.

(II) Terrestrial Ecological Assessment

- I. Identify rare species, proposed or listed endangered or threatened species and critical habitats which have been identified within a four (4) mile radius of the site. This requirement is met by including all rare species, proposed or listed endangered or threatened species, and critical habitats identified by the Tennessee Wildlife Resources Agency (TWRA), the Department's Division of Ecological Services, and the U.S. Department of Interior Fish and Wildlife Service.
  - II. Determine if the area possibly impacted by the site contains rare species, proposed or listed endangered or threatened species, or critical habitats.
  - III. Further assessment may be required by the Department if the Department suspects unacceptable impact or risks to critical habitats, proposed or listed endangered or threatened species habitats, or indicator species within the food web. Further assessment may also be required if contamination originating at the site impacts or potentially impacts public lands including, but not limited to, national parks, national forests, state parks, and state designated wildlife areas. Methods may include, but are not limited to, soil toxicity testing, ecological effects assessments, or determination of bioaccumulation of chemicals in site biota.
4. Remediation goals may be established by using a combination of approaches 1. through 3. (e.g., using MCL's for the ground water remediation goal and utilizing the human health and environmental risk assessment approach or the background approach to determine soil remediation goals.)
- (i) Approval from the Department must be received before site specific standards or site specific remediation goals become effective.

- (ii). The remediation goal must be met at the appropriate points of compliance at the site as established by the Department after affording a liable party the opportunity to provide input and after undergoing a public participation process (e.g., Public Notice). The location of the points of compliance shall be based on factors including but not limited to the nature of the site and surrounding area, site access, and potential or actual points of exposure. Unless the site is located in karst terrain and the water table is located at or below the top of bedrock for part of the year, or Dense nonaqueous phase liquids (DNAPL's) are present, the point of compliance for ground water at former waste management areas shall generally be a vertical surface located at the hydraulically downgradient limit of the former waste management area that extends down into the upper aquifer underlying the site. Soils are normally sampled at locations selected because of site history, or actual or potential human exposure, or environmental receptors. Generally, points of compliance for soil shall include all areas which contain contaminants in excess of remediation goals identified in Part (a)(3).

Points of compliance different from those required by the Department can be established by a liable party, pending approval by the Department, after undergoing a public participation process.

- (iii). The Department recognizes that selected remedial actions may involve containment of hazardous substances. Any hazardous substance left on-site must be contained within a specified area and be protective of human health and the environment. A compliance monitoring program must be designed to insure the long-term integrity of the containment system. Unless otherwise approved by the Department, a ground water monitoring program approved by the Department shall be required for all areas where containment is a remedial action.
- (iv). Unless otherwise approved or determined by the Department, the following shall apply:
- I. Institutional controls shall be required whenever a remedial action does not address concentrations of hazardous substances which pose or may pose an unreasonable threat to the public health, safety, or the environment.
  - II. Institutional controls shall be required for all areas where containment is a remedial action or the Department authorizes the discontinuance of pump and treat of ground water prior to attaining remediation goals.
  - III. Institutional controls shall include, at a minimum, deed restrictions for sale and use of property, and securing the area to prevent human contact with hazardous substances which pose or may pose a threat to human health or safety.
- (v). Establishment of remediation goals under these rules and subsequent remediation to those goals may not relieve a liable party from liability under CERCLA including, but not limited to, liability under CERCLA §107(a)(4)(c) concerning damages for injury to, destruction of, or loss of natural resources.

# Preliminary Remediation Goals

2 4 0321

Chemical Compound*	Goal	Chemical Compound*	Goal
2,3,7,8-TCDD (dioxin)	3E-8	Dichloroethylene (1,1-)	0.007
2,4 D	0.07	Dichloroethylene (cis-1,2-)	0.07
2,4,5-TP	0.05	Dichloroethylene (trans-1,2-)	0.1
Alachlor	0.002	Dichloropropene (1,2-)	0.005
	..	Ethylbenzene	0.7
	..	Ethylene dibromide (EDB)	0.00005
Aluminum	0.2***	Fluoride	4.0
Antimony	0.006	Hepachlor	0.0004
Arsenic	0.05	Heptachlor epoxide	0.0002
Asbestos	7 million fibers/liter	Iron	0.3***
Atrazine	0.003	Lead	0.015***
Barium	2.0	Lindane	0.0002
Benzene	0.005	Manganese	0.05***
Beryllium	0.004	Mercury	0.002
Bromodichloromethane (THM)	0.1	Methoxychlor	0.04
Bromoform (THM)	0.1	Monochlorobenzene	0.1
Cadmium	0.005	Nickel	0.1
Carbendazim	0.04	Nitrate	10.0
Carboxen tetrachloride	0.005	Nitrate and Nitrite (total)	10.0
Chlordane	0.002	Nitrite	1.0
Chlorodibromomethane (THM)	0.1	Pentachlorophenol	0.001
Chloroform (THM)	0.1	Polychlorinated biphenyls (PCB's)	0.0005
Chromium	0.1	Selenium	0.05
Copper	1.3***	Silver	0.1***
Cyanide	0.2	Syrene	0.1
Di(2-ethylhexyl)phthalate	0.006	Tetrachloroethylene	0.005
Dichloromethane	0.005	Thallium	0.002
1,2,4-Trichlorobenzene	0.07	Toluene	1.0
1,1,2-Trichloroethane	0.005	Toxaphene	0.003
Dalapon	0.2	Trichloroethane (1,1,1-)	0.2
Dinoseb	0.007	Trichloroethylene	0.005
Diquat	0.02	Trichloromethanes (total)	0.1
Endosulf	0.1	Vinyl chloride	0.002
Endrin	0.002	Xylenes (total)	10.0
Glyphosate	0.7	Zinc	5.0***
Hexachlorobenzene	0.001		
Hexachlorocyclopentadiene	0.05		
Oxamyl (vydate)	0.2		
Picloram	0.5		
Simazine	0.004		
Benzo(a) pyrene	0.0002		
Di(2-ethylhexyl)adipate	0.4		
Dibromochloropropane (DBCP)	0.0002		
Dichlorobenzene o-m-	0.6		
Dichlorobenzene p-	0.075		
Dichloroethane (1,2-)	0.005		

\* All levels in part per million and are MCL's unless otherwise noted.

\*\* These are SMCL's

\*\*\* Lead is an action level rather than a MCL.

Unless otherwise defined in this rule, the definitions found in paragraph (2) of Rule 1200-1-11-.01, "Hazardous Waste Management System: General," shall apply when those terms are used in this chapter. In addition, when used in this chapter, the following terms have the meanings given below:

- (a) "Act" means the Tennessee Hazardous Waste Management Act of 1983 (T.C.A. Title 68, Chapter 212, Part 2; enacted as Chapter 423 of the Public Acts of 1983).
- (b) "Acute Hazardous Waste" means those wastes defined in 40 CFR 261.11(a)(2) incorporated by reference at Department Rule 1200-1-11-.02(2)(a) effective February 13, 1994.
- (c) "Applicable Requirements" means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA or hazardous substance site.
- (d) "Aquifer" means a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs.
- (e) "Area of Contamination" means the horizontal and vertical extent of contamination in air, soils, sediment, drinking water supply, surface water, ground water, subsurface strata, or on the land surface occurring or originating at a hazardous substance site.
- (f) "CERCLA" is the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. (42 USC).
- (g) "Clean up" shall be defined as the clean up or removal of released hazardous substances from the environment, such actions as may be necessary taken in the event of the release or threat of release of hazardous substances into the environment, such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances, the disposal of removed material or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health, or welfare or to the environment, which may otherwise result from a release or threat of release. The term includes, in addition, without being limited to, security fencing or other measures to limit access, provision of alternative water supplies, and temporary evacuation and housing of threatened individuals.
- (h) "Contaminant" means pollutant.
- (i) "Control Background" means the concentration of hazardous substances consistently present in the environment due to long term localized industrial or commercial activities.
- (j) "Department" means the Department of Environment and Conservation.
- (k) "Disposal" means the discharge, deposit, injection, dumping, spilling, leaking or placing of any hazardous substance into or on any land, water or air so that such hazardous substance or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.
- (l) "Feasibility Study" or "FS" means a study to develop and evaluate options for remedial action. The Feasibility Study emphasizes data analysis and is generally performed concurrently and in an interactive fashion with the Remedial Investigation using data gathered during the Remedial Investigation. The Remedial Investigation data are used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives. The term also refers to a report that describes the results of the study.
- (m) "Fund" means the Hazardous Waste Remedial Action Fund created by the Act.
- (n) "Generator" means any person whose act or process produces hazardous substance or whose act first causes a hazardous substance to become subject to regulation.
- (o) "Ground water" or "Groundwater" means water below the land surface in a zone of saturation.

- (q) *"Hazardous Substance Site"* means any site or area where hazardous substance disposal has occurred.
- (r) *"Hazardous Waste Remedial Action Fund"* (Fund) means that fund described in T.C.A. Section 68-212-204.
- (s) *"Natural Background"* means the concentration of hazardous substance consistently present in the environment which has not been influenced by localized human activities.
- (t) *"Person"* means an individual, trust, firm, joint stock company, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, any interstate body, and governmental agency of this state and any department, agency, or instrumentality of the executive, legislative, and judicial branches of the Federal government.
- (u) *"Pollutant"* shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring.
- (v) *"Preliminary Remediation Goals"* means a site specific standard based on Applicable Requirements, Relevant and Appropriate Requirements, and/or Background Concentrations for sites which do not require a feasibility study or for interim actions conducted prior to completion of the feasibility study. If the Department suspects background concentrations do not protect public health, safety, and the environment, the Department may require the assessment of risk posed by background concentrations of the hazardous substance(s) to be included in the determination of the preliminary remediation goals.
- (w) *"Promulgated List"* is the List of Inactive Hazardous Substance Sites required by T.C.A. Section 68-212-206(c).
- (x) *"Publicly Owned Treatment Works" or "POTW"* means a treatment works as defined by Section 212 of the Clean Water Act, which is owned by a State or municipality (as defined by Section 502(4) of the Clean Water Act).
- (y) *"Record of Decision" or "ROD"* is that document that provides the official decision on the final alternative for site cleanup. It includes an explanation of the reasons for choosing that alternative and details any conditions or standards that must be met.
- (z) *"Release"* means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant).
- (aa) *"Relevant and appropriate requirements"* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA or hazardous substance site, address as problems or situations sufficiently similar to those encountered at the hazardous substance or CERCLA site so that their use is well suited to the particular site.
- (bb) *"Remedial Investigation" or "RI"* means a process to determine the nature and extent of the problem. The remedial investigation emphasizes data collection and site characterization, and is generally performed concurrently and in an interactive fashion with the feasibility study. The remedial investigation includes sampling and monitoring, as necessary, and includes the gathering of sufficient information, to determine the necessity for remedial action and to support the evaluation of remedial alternatives.
- (cc) *"Remediation Goal"* means a site specific standard based on applicable requirements, relevant and appropriate requirements, background concentrations and/or risk assessment for sites where a risk assessment and feasibility study have been completed.

- (dd) *"Remedy or Remedial Action"* (R/A) means those actions consistent with a permanent remedy taken instead of, or in addition to a removal action. The term includes, but is not limited to, such actions as storage, confinement, perimeter protection using dikes, trenches, or ditches, clay cover, neutralization, cleanup of released hazardous substances and associated contaminated materials, recycling or reuse, diversion, destruction, segregation of reactive wastes, dredging or excavations, repair or replacement of leaking containers, collection of leachate and runoff, on-site treatment or incineration, provision of alternative water supplies, any monitoring reasonably required to assure that such actions protect the public health, safety, and the environment and, where appropriate, post-removal site control activities. This term also includes, but is not necessarily limited to the off-site transport and off-site storage, treatment, destruction, or secure disposition of hazardous substances and associated contaminated materials.
- (ee) *"Removal"* means the cleanup or removal of hazardous substances from the environment; such actions as may be necessary taken in the event of the threat of release of hazardous substances into the environment; such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health, safety, or environment which may otherwise result from a release or threat of release.
- (ff) *"Response"* means a clean up, remedial action, remedy, remedial investigation, or any other action taken by the Department in furtherance of the purpose of the Act and/or these Rules.
- (gg) *"Responsible party"* means liable party.
- (hh) *"Risk Assessment"* means a qualitative and quantitative process to characterize the nature and magnitude of risks to public health, safety, and the environment from exposure to hazardous substances released from specific sites.
- (ii) *"Solid Waste Disposal Control Board" or "Board"* means the solid waste disposal control board as established by T.C.A. Section 6S-211-111, unless otherwise indicated.
- (jj) *"Surface water"* means lakes, rivers, ponds, streams, inland water, and all surface waters and water courses within the State of Tennessee or under the jurisdiction of the State of Tennessee.
- (kk) *"UAPA" or "Uniform Administrative Procedures Act"* means that Act promulgated as T.C.A. 4-5-201 et seq.

2 4 0324